was a valid one, and to date no such evidence has been placed on the record, there is no solid basis in fact for the proposed discount.

As stated above, Sprint has provided the Commission with actual cable material costs. There is no need to calculate a "discount" when actual cable costs have been provided. The Commission should use the costs that have been provided by Sprint and other companies, assuming that those costs represent forward-looking economic costs. Alternatively, at a minimum, a tiered discount should be established based on a range of company sizes.

**Paragraph 79**

Appended hereto is Attachment 2 which shows Sprint proposed actual cable costs broken down into material and installation, engineering, and splicing. This was done to make an "apples to apples" comparison to the NRRI data. Included in the material costs of both are miscellaneous materials and installation. The material portions of Sprint's cost were compared to the non-discounted costs derived from the NRRI study. As seen in the charts in Attachment 2, buried material costs are reasonably close and thus do not require adjustments. Aerial cable is underestimated by NRRI, and underground cable is overstated in the larger cable sizes by NRRI.

The aerial cost is understated by approximately \$0.80 in each size. Sprint's installation cost is \$1.84, as compared to the NRRI constant value of \$1.02. While Sprint cannot comment on other companies' costs, Sprint recommends increasing the constant value of the regression by \$0.82 to correct the understatement of cost for mid-sized LECs.

A serious econometric problem exists with the regression equation for underground cable. Specifically, the underground cable regression presented by the Commission causes negative values to be calculated for the two largest cable sizes. The formula states that the square of the cable size is multiplied by -. 000004. This causes the material costs to decline from cable size to cable size, and in the largest sizes causes the total cable cost to become negative. Due to this fact, the last portion (x^2 * -.000004) of the formula was ignored for the comparative analysis attached.

**Paragraph 80**

Sprint would propose that engineering cost be developed on a flat "per-foot" cost as detailed in the table below. The proposed Commission methodology causes engineering cost to be overstated on larger cables and understated on smaller cables. Using the Commission's approach, engineering a 1,000-foot length of 2,400 pair aerial cable would cost $2,075 (representing approximately 40 hours of work). Engineering the same 1,000 length of 25 pair cable would cost only $123 (approximately 2 ½ hours of work). This difference is not realistic, nor is it reasonable.

Most of the same constraints and conditions must be faced regardless of the size of the cable placed. These may include such things as route layout, obtaining permits, securing rights-of-way, joint use coordination, etc. These costs do not necessarily vary with regard to the size of the cable being installed. Therefore, cable engineering should be based upon a per foot charge and not cable cost.

Sprint makes the following engineering cost recommendations for both the NRRI data and its filed data. Specifically, Sprint recommends a per foot engineering cost of:

| Copper Cable Type | Engineering Cost per Foot |
|---|---|
| Aerial | $0.7960 |
| Underground | $1.1906 |
| Buried | $0.6327 |

These results are based upon the actual data filed February 24, 1999 in the response to the Commission's Outside Plant and Cable Cost Survey.

**Paragraph 81**

Sprint agrees that a splicing additive is required to the NRRI regression but recommends a "per pair foot" cost additive instead of a straight 9.4% across the board adjustment. Buried and aerial splicing costs are relatively the same, but underground splicing costs are of course higher due to the need to work in manholes. Based upon the proposed cable prices, the splicing costs per pair for the three cable types are as follows (these numbers are based on Sprints actual splicing costs):

| Copper Cable Type | Splicing Cost per Pair |
|---|---|
| Aerial | $0.0030 |
| Underground | $0.0040 |
| Buried | $0.0030 |

**Paragraph 82**

See Sprints comments in the following sections:

1. 72 relative to NRRI Study Comments
2. 79 for a discussion of discounts
3. 80 for a discussion on engineering costs
4. 81 for a discussion on splicing costs

**Paragraph 83 – 24 Gauge Buried Cable**

See Sprints comments in the following sections:

1. 72 relative to NRRI Study Comments
2. 79 for a discussion of discounts
3. 80 for a discussion on engineering costs

4. 81 for a discussion on splicing costs

**Paragraph 86**

As Sprint commented regarding paragraph 72 of the FNPRM, the costs provided to the Commission for larger cables may already be the costs for 26-gauge cable, and should not be adjusted. For example, Sprint is not aware that cables larger than 3,000 pairs can even be purchased in 24 gauge and Sprint does not purchase any significant quantity of larger sized cable in 24 gauge. Knowing that it would be unreasonable to model a cable size that does not exist, or is not used, Sprint provided the cost of cable that does exist, the cost of 26-gauge cable. Sprint's cable costs over 900 pairs already assume a 26-gauge price. Finally, since some of these larger cable sizes are not even available in 24 gauge, the prices provided must clearly have already been for 26-gauge cable and should not be adjusted. Overall, Sprint recommends the use of the actual LEC 26 gauge cable cost data.

**Paragraph 89**

Sprint concurs with the need for different cable prices for the three structure types. Placement of each of these types of cable requires very different installation activities and there is no reason to assume that the cost would be the same.

**Aerial Fiber Cable**

**Paragraph 90**

Sprint does not agree with the use of RUS data for calculating aerial fiber cable costs but recommends the use of actual cable costs as provided by Sprint in the Commission data request.

Similarly, as noted with respect to the use of NRRI data to calculate fiber cable costs, Sprint asserts that NRRI data not be used to determine the cost of aerial fiber cable.

**Paragraph 91**

Sprint does not support the three proposed adjustments to the aerial fiber costs.

1) The NRRI study proposes a 33.8% discount of aerial fiber and 27.8% discount for buried and underground fiber based upon the large purchasing capacity of an RBOC. The NRRI study relies on a single observation from Bell Atlantic in a proceeding in Maine, an observation on data that, as noted above, may not be comparable at all. This single case is not necessarily representative, nor applicable, nor even defendable. Nor does this reflect smaller discounts that smaller companies receive. As noted above, the best way to determine an appropriate discount is to use the company data provided to the Commission. Sprint has completed this comparison in Attachment 3 to these comments, which shows that the NRRI fiber material costs are currently below Sprint's costs. Therefore, Sprint is recommending that no discount be applied.

2) Engineering costs should be based upon a per foot charge rather than a percentage of cable cost. The reasons for this are similar to those presented above with respect to copper cables. Based upon the information previously submitted to the Commission, Sprint recommends the following fiber engineering costs:

| Fiber Type | Engineering Cost per Foot |
|---|---|
| Aerial | $0.3049 |
| Underground | $0.7355 |
| Buried | $0.5788 |

3) Splicing costs are not the same across the three structure types. Buried and aerial splicing costs would be similar, but the costs associated with splicing underground fiber is considerably greater. This is due to the set up costs associated with underground work. Sprint proposes the following splicing costs based upon the data provided to the Commission on February 24, 1999:

| Fiber Type | Splicing Cost per Fiber Per Foot |
| --- | --- |
| Aerial | $0.0024 |
| Underground | $0.0080 |
| Buried | $0.0032 |

**Underground Fiber Cable**

**Paragraph 92**

Sprint has the same concerns for use of the RUS data as noted in Paragraph 72

**Paragraph 93**

Sprint has the same concern for discount, engineering and splicing as noted in Paragraph 91.

**Buried Fiber Cable**

**Paragraph 94**

Sprint has the same concerns for use of the RUS data as noted in Paragraph 72

**Paragraph 95**

Sprint has the same concern for discount, engineering and splicing as noted in Paragraph 91.

Cable Fill Factors

Variance Among Density Zones

Paragraph 97

Sprint agrees with the Commission's finding that the lower density zones should utilize lower cable fill factor inputs.

Distribution Fill Factors

Paragraph 100

Sprint is puzzled by the tentative conclusion set forth in paragraph 100. The Commission states that it tentatively adopts the HAI default distribution fill factors. The default HAI distribution fills in HAI 5.1 are .75 for all density zones. The default HAI distribution fills in HAI 5.0a match the inputs described in Attachment A to the FNPRM. Does the Commission intend this statement to refer to the HAI 5.0a defaults?

While Sprint is concerned that cable maintenance costs should be increased to reflect the higher cable utilization, assuming the HAI 5.0a inputs and the Synthesis Model methodology, Sprint would not object to the proposed distribution fill factors as they appear to reasonably represent realistic, forward-looking practices.

Feeder Fill Factors

Paragraph 101 - Copper Feeder Fill

Sprint finds the Commission selection to average HAI and BCPM default inputs to be reasonable and asserts that no further change is required. The fill factors proposed are:

| Density Zone | Fill Factor |
|---|---|
| 0 | 70.0% |
| 5 | 77.5% |
| 100 | 80.0% |
| 200 | 82.5% |
| 650 | 82.5% |
| 850 | 82.5% |
| 2550 | 82.5% |
| 5000 | 82.5% |
| 10000 | 82.5% |

**Fiber Fill Factors**

**Paragraph 102**

Sprint finds the Commission's conclusion to be accurate for fiber feeder fill of 100% for all density zones assuming that the model continues to model 100% fiber redundancy.

**Structure Costs**

**Costs of Aerial Structure**

**Paragraph 107 - Pole Costs**

The NRRI study used to calculate aerial structure costs reports an average material price of $213.94 for a 40-foot, class 4 telephone pole. Assuming this is a bare material cost, Sprint would agree that this is a reasonable cost for material only. However, the regression formula for aerial structure shown in Appendix D, Section III (A) of the FNPRM results in a pole cost (exclusive of anchors and guys and LEC engineering) of $310.65 in a normal terrain area. Given these values, the proposed inputs indicate that the shipping, sales tax, supply expense, and labor costs related to placing a pole in service equals approximately $97.00, which, Sprint asserts, is substantially understated. A nine-company average of Sprint's actual costs shows a cost of approximately $367.00 for material overheads and labor costs per pole.

### Paragraph 108 - Anchor and Guy Costs

The proposed values for anchor and guy costs appear to reflect the frequency of use (*i.e.*, not every pole has an anchor and guy), and Sprint agrees this is appropriate. In addition, while the values shown may be somewhat understated compared to a nine-company average of Sprint's actual costs ($39.00 in rural areas to $71.00 in urban areas), the inputs do not appear to be unreasonable. However, the input values should vary across terrain types to reflect that there are additional costs for placement in rocky areas (as the inputs for pole placement recognize).

### Paragraph 109 - Engineering

While an additional loading for LEC engineering is appropriate for calculating the cost of aerial structure, the proposed engineering loading should be based on actual company data. The proposed 10% loading is nothing more than a simple average of inputs from previous proxy cost models which are no longer under consideration and, therefore, does not necessarily represent an appropriate loading factor. Use of company-specific engineering loading factors would be more appropriate.

### Paragraph 110 - Aerial Cost per foot

The process used to convert the estimated pole costs into a per foot cost results in excluding the cost of the first pole or last pole in each span. For example, a 1000-foot span in density zone 1 requires 5 total poles (1 on each end and 3 in between placed every 250 feet). The proposed per foot cost would capture costs for only 4 of those poles however, which is a 20% understatement. Obviously, as density increases (and pole spacing decreases) and the length of the span increases, this understatement decreases, but even at a 6000 foot span in urban areas (with a 150 foot spacing), there is still a 2.4% understatement.

### Underground Structure Costs

### Paragraphs 111 and 112

For a number of reasons, Sprint does not agree with the methodology proposed to calculate underground structure costs. First, since the RUS data used to develop the regression equation is from companies operating only in the two lowest density zones, the amounts are not representative of costs that would be incurred in more urban, higher-density areas, where the majority of underground construction actually occurs. Second, an extrapolation method using average inputs (or more specifically, percent change in input values) from previous proxy models to generate the values for density zones 3 through 9 is possibly inaccurate and introduces unneeded complexity. The most appropriate source for this input is actual company-specific data reflecting placement in all density zones. For example, the cost for underground structure in 11 of Sprint's local operating companies ranges from $4.25 to $13.38 (assuming normal terrain). (See Attachment 4.)

In addition, the comments and methodology laid out in Appendix D to the FNPRM seem to imply that the proposed inputs include both the cost of the trench and the cost of the duct material. However, this is obviously incorrect since the number of ducts in any particular conduit run is determined by the amount and mix of cable in that route. This input should represent the labor cost of the structure only.

For the same reasons as stated above, the proposed 10% LEC engineering loading may not represent an appropriate loading factor. Using company-specific engineering loading factors would be more appropriate.

Buried Structure Costs

**Paragraphs 113, 114, and 115**

Similar to the comments above concerning underground structure, Sprint does not agree with the methodology proposed to calculate buried structure costs. Again, the RUS data used to develop the regression equation is from companies operating only in the two lowest density zones, and is not representative of costs that would be incurred in more urban, higher-density areas. Also, as discussed above, the extrapolation method used to generate the values for density zones 3 through 9 produces inaccurate inputs and introduces unnecessary complexity. The most appropriate source for this input is actual company-specific data reflecting placement in all density zones. Indeed, Sprint provided this data for 68 of its wire centers in it February 24, 1999 response to the Commission's request for data on outside plant structure and cable. Using Sprint's 68 data points, a linear regression can be built which results in buried structure costs ranging from $1.51 in Density Zone 1 to $7.74 in Density Zone 9 for normal terrain. (See Attachment 4.)

For the same reasons as stated above, the proposed 10% LEC engineering loading may not represent an appropriate loading factor. Using company-specific engineering loading factors would be more appropriate.

**Plant Mix**

**Paragraph 116**

Sprint is strongly opposed to the use of a national average plant mix. A national plant mix is not fact based, and not representative of what an efficient provider would build in any particular region or area. Additionally, it is probably the easiest input to develop on a study area or state basis.

The decision to place aerial, buried or underground cable is driven by many factors. Some are identifiable in the model data, but many are not. For instance, exposure to severe weather, local zoning ordinances, and growth rates, clearly have a genuine impact on cable selection. These things cannot be reasonably modeled, but they can be successfully reflected in the inputs to the model if the inputs are allowed to vary by state, region or company.

Local plant engineers, on site, have already selected the economically sensible plant mix for the area. They have considered all the relevant drivers and made an optimized decision. Clearly, the existing plant mix is the best available, fact-based indicator of the appropriate plant mix.

By using a national plant mix along with a national maintenance factor, the model would significantly understate costs in some areas. A particularly good example would be modeling an extensive use of aerial cable in the Southeast coastal region. Aerial structure is very expensive to maintain in this area of the country as a result of hurricanes and other weather systems that hit the coast. This, of course, is the reason why relatively little aerial plant is built, and why the aerial plant that does exist requires higher than normal maintenance. Using a national plant mix along with a national maintenance factor would cause the costs for these serving territories to be greatly understated.

By using company-specific or state-specific plant mix, the model could rely on the experts that originally installed the plant based upon economically sound judgement. The engineers have already accounted for weather conditions, terrain type, and local zoning guidelines in the placement of the outside plant.

**Paragraph 119**

If national inputs are selected, Sprint would concur with the Commission's decision to use BCPM default inputs.

**Paragraph 121 - Feeder Plant Mix**

If national inputs are selected, Sprint would concur with the Commission's decision to use BCPM default inputs.

**Alternatives to Nationwide Plant Mix**

**Paragraph 123**

Please refer to section above titled "Optimization".

**Paragraph 124**

Sprint recommends that the state, or study area specific plant mix be determined by taking the relative percentage of trench feet of conduit, sheath feet of aerial cable, and sheath feet of buried cable as reported in the ARMIS data. Trench feet of conduit would be an accurate measure of conduit share. Buried sheath feet would be a very close representation of buried trench feet, since relatively little buried cable is paralleled. It is possible that the total footage of aerial cable may be overstated somewhat relative to route footage. However, analysis of Sprint's data found that resulting percentage change was not as large as one might expect, generally less than 3%.

**Paragraph 125**

While it would be theoretically appealing for the Synthesis Model to choose plant mix by minimizing annual cost, the forward-looking reality is that there are numerous "cost" factors not included in the model as well as the very real "non-cost" factors that an efficient provider will face when choosing plant mix.

For instance, a reasonable LEC might find it economically efficient to pay some additional up front cost to bury a cable in an area that receives a great deal of ice and snow, because the buried cable would be less costly to maintain. However, the model has no knowledge of the above national average annual cost that local weather causes in such a situation.

Similarly, as the Commission notes, local ordinances may require that plant be buried for no other purpose than "aesthetic appeal". While the Commission suggests that this might not warrant consideration in the plant mix decision, the reality is that a new, efficient provider will be faced with the same local ordinances and, therefore, the costs of building plant will reflect the effects of these ordinances. So too must the costs produced by the Synthesis Model, which cannot incorporate such real-world cost drivers.

Sprint believes that the most reasonable approach to plant mix is to use study area or state specific plant mix. The existing plant mix is the culmination of all the day-to-day "optimization" decisions made by engineers as they strive to minimize costs using local knowledge of weather conditions, zoning constraints, terrain conditions, and other pertinent information.

**Structure Sharing**

**Paragraph 129**

Sprint finds the proposed structure sharing percentage for underground conduit in all zones and for buried cable in zones 4-9 to be unsupported and unachievable.

With regard to underground conduit, Sprint provided to the Commission extensive, expert review of National Electrical Safety Code regulations, which all but preclude the sharing of a conduit trench with other utilities. Sprint further detailed the economic risks that another provider would under take sharing a trench with a telephone company's conduit system. Sprint previously provided the Commission with a financial analysis that clearly demonstrated that the "leasing" of duct space from an incumbent LEC was far more economical alternative to sharing the trench. As all parties recognize, leasing duct space is not at all the same as sharing the cost of a common trench and placing two separate conduit systems within the common trench. The cost for additional duct capacity beyond the needs of the telephone network is not modeled in the Synthesis Model and, therefore, no leasing of duct space should be contemplated. In other words, the Commission should not utilize a structure sharing input which reduces duct costs that are not included in the model to begin with. Further, as evidenced in the analysis and documentation provided by Sprint, the opportunities for sharing underground structure is limited, and the related Synthesis Model inputs should reflect this forward-looking reality.

Sprint has also provided extensive, documented, expert review of the many factors that impact the ability of a company to share a trench, not the least of which is that there must be some other party with a need to go the same place at the same time that the trench is open. This may occur in distribution in new subdivisions, but would very rarely be the case in the feeder cable. Sprint's has documented code limitations, and the economics of sharing, as well as the additional costs that a provider would incur to share a trench. If these opportunities for sharing were truly available and truly economical, one would be forced to ask why price-regulated LECs, with every incentive to operate efficiently, would not make the smart economic decision to share? The fact is that LECs *are* operating efficiently and that the opportunities for sharing are not as significant as some might imagine. Nor will a host of opportunities suddenly become available to new, efficient providers.

Forward-looking economic costs should represent the cost that would be incurred by a new entrant building a network in the market using forward-looking technology and best industry practices. If the Synthesis models a LEC with facilities in place to serve the entire market, one must ask exactly who is going to share trench costs with the LEC being modeled. In order to attain the proposed sharing percentages, one must assume a scorched earth scenario in which not only the telephone network, but also all other utilities' infrastructure is wiped off the face of the earth and is rebuilt at one time.

Furthermore, 100% of market place demand is assumed to be served by a single LEC. If it is suddenly assumed that these other providers hold some market share, then that market share should be backed out of the LEC's access lines. This would undoubtedly result in higher unit costs, as fewer customers are served in the same geography.

The structure sharing percentage is inexorably linked to the structure cost. The buried structure costs that Sprint has provided to the Commission are actual "post-sharing" structure cost. They reflect only the cost that Sprint actually incurred. It would be completely inappropriate to apply a sharing percentage on top of Sprint's post sharing costs. Further, as Sprint has previously pointed out, a shared trench is more costly than a single use trench. These additional costs must be added to the telephone company's cost if higher levels of sharing are to be assumed. The RUS data also contains post-sharing costs and any additional sharing would amount to double dipping. As the report states, "... the buried costs reported in this database largely reflect the costs incurred by LECs after taking sharing into account."[8] It is, therefore, Sprint recommendation that the Commission use the BCPM default as the recommended sharing percentage.

**Paragraph 132**

The Commission has defined "forward-looking costs" as being least-cost, most efficient and <u>currently available</u>. Clearly then, an unsupported, future "potential" for sharing cannot serve as a basis for a forward-looking structure sharing percentage.

The Commission has stated many times the need to be fact–based. One must ask upon what factual basis the Commission might rely to determine the potential for structure sharing?

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[8] *Estimating the Cost of Switching and Cables Based Upon Publicly Available Data*, The National Regulatory Institute, at p. 33.

Contrary to the claims of other parties, ***nothing*** has been put forward in the record that substantiates the idle conjecture that changes in the telecommunications regulatory climate have increased the likelihood of other non-telecommunications-related utilities sharing structure costs with telephone companies. Sprint is unaware of any specific regulatory changes that ***require*** sharing. It is doubtful that the deregulation of the telecommunications industry has changed the economics of burying power cable, or caused CATV companies to expand out into new rural areas. Additionally, the proliferation of Direct Broadcast satellite and the negative impact to CATV growth in rural areas force Sprint to question the suggestion of increased opportunities for structure sharing.

A large and growing portion of the LEC industry operates under price cap regulation. If the economics for structure sharing were there, why would not the LECs be availing themselves of those opportunities? If LECs could cut their structure costs by 50%, they would certainly do so. The RUS data recognizes sharing in its cost structure and shows that there are no sharing opportunities in rural areas. "The contracts indicate that the vast majority of the buried cable is plowed rather than trenched.... When cables are placed through plowing, the cost is rarely shared with other utilities"[9]. If joint trenching were more cost effective than plowing and there was someone to share the trench with, why would not the RUS companies be sharing? Yet, based on the RUS data, they are not.

Forward-looking costs must be fact-based and represent a currently achievable cost structure. They cannot be based on unsupported, agenda-driven conjecture designed to reduce costs to artificially low levels.

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[9] *Estimating the Cost of Switching and Cables Based Upon Publicly Available Data*, The National Regulatory Institute, P.32.

Serving Area Interfaces ("SAI")

**Paragraph 138**

The Commission notes that the sole tangible support for a splicing rate of 300 pairs per hours is a letter from a manufacturer that sells splicing equipment to a potential large customer. The letter is not supported by any facts, data, or studies. It is, quite simply, the unsupported claim of someone trying to sell equipment.

At the same time, the Commission completely ignores actual data available from the RUS study, which tells a significantly different story. On page 9 of their February 8th, 1999 *ex parte*, AT&T/MCI (the HAI Sponsors) state that the NRRI RUS data demonstrates that the average cost to do modular splicing (the type of splicing in question) was $95.37 per 100 pair. Assuming the AT&T/MCI hourly rate for a splicer of $55.00, it is obvious that it takes 1.7 hours to splice 100 pairs ($95.37/$55.00) or an average of 58.8 pairs per hour. This is clearly inconsistent with the 300 pairs per hour that AT&T/MCI use in their splice cost calculations for SAIs and in their February 8th, 1999, *ex parte* calculations.

The RUS data is based on contract bid work on large projects in conditions encountered by rural LECs. They are competitively bid, and would presumably reflect the least-cost, most efficient costs available. Sprint is puzzled by the Commission's decision to depend on the RUS data for cable costs and subsequently ignore the same data with regard to splicing. Such self-selection of data is inappropriate – either the data is correct or it is not.

**Paragraph 139**

The cross-connect method proposed by AT&T is not an SAI, but a simple building entrance terminal. The original diagrams and photos submitted by AT&T and Sprint in *ex parte* presentations to the Commission were fundamentally identical. After several ever-changing design iterations by AT&T "experts", AT&T representatives produced a grossly simplified structure which it stated it had seen in many buildings. Sprint does not doubt that AT&T representatives have seen this structure, but unfortunately what they have seen is not an SAI at all but a building terminal. The proposed design completely defeats the purpose of an SAI by eliminating the ability to cross-connect feeder and distribution facilities. Building terminals are identified as a separate input in each of the models.

**Paragraphs 144-145 - Digital Loop Carriers**

Sprint agrees with the Commission staff's approach to utilize actual contract data submitted for DLC inputs, as shown in Appendix A of the FNPRM. We also concur that the HAI sponsor inputs are unrealistically low and completing lacking in support data. Sprint provided *ex parte* comments and cost support on June 24, 1999 which indicates that the staff inputs for DLC are in line with Sprint's actual costs, including material handling and shipping. It is important to recognize, however, that these costs are appropriate only in context with development of costs for universal service cost support.[10] Circuit equipment, switching, and transport costs will be higher in order to support provision of UNEs due to NGDLC technical limitations and the inherent network inefficiencies of an unbundled network.

[10] Please see earlier discussion on UNE costing as it relates to the Synthesis Model.

## Switching and Interoffice Facilities

### Switch Costs

#### Adjustments to Data

### Paragraphs 154-156

The data utilized by the Commission's staff was adjusted to exclude all switch upgrade costs as indicated in Appendix E of the FNPRM, which raises serious concerns. First, high technology industries in general experience rapid cost changes, as is certainly the case with digital switching technology. Second, unlike a cable or conduit which will remain in service with no change over its useful service life, substantial upgrade costs are required annually to upgrade switching equipment to meet the rapidly changing numbering, routing, and billing changes relative to basic local service. Attachment 5 to these comments depicts some of the major upgrade mandates. Absent these upgrades, a switch purchased in 1994, for example, could not meet the minimum dialing standard requirements of today.

A personal computer purchased in 1994 would likely be equipped with an older version of Windows and perhaps a 386 microprocessor. The same computer today is quite likely to have been upgraded or even replaced with new software and hardware to meet the computing requirements of today. Digital switching technology follows a similar dynamic upgrade requirement. Moreover, it is common industry practice for switch vendors to offer substantially lower per-line price levels for initial switch placements versus subsequent upgrades and additions, since once in place, LECs are "locked" to a particular vendor's equipment. The California PUC recognized this pricing relationship and its subsequent impact on switching costs in a 1998 rulemaking.[11] In fact, during

[11] California PUC UNE Decision 98-02-106 February 19,1998. Reference is PUC quote from 1994 NBI study, pg. 71.

this proceeding, AT&T's witness, Ms. Catherine Petzinger states "The discount percentage input (to Bellcore's SCIS model) should reflect the mix of new switch and growth switch lines that Pacific actually plans and has committed to purchase". Sprint agrees with this conclusion. Failure to differentiate between initial versus add-on costs for digital switching, and exclusion of mandatory upgrade costs in support of basic local service requirements is not consistent with forward-looking costing principles.

Sprint is concerned that the methodology incorporated to achieve the proposed data set may be theoretically unsound. The proposed data set contains observations that exclude any data related to switch upgrades and growth. As discussed above, switching technology evolves constantly. The costs displayed in the data set are not a true representation of today's costs. Furthermore, over 70% of the original data has been 'cut' to obtain the proposed data set. Sprint agrees minor adjustments may be necessary to 'clean' a data set. However, after conducting preliminary analysis, the evidence suggests the data no longer accurately explain switch costs. Sprint conducted regression analysis on the two data sets (depreciation and RUS) individually and arrived at the following conclusions:

1. No RUS variables are significant (5% level of significance).
2. Only the 'lines*1/time' variable in the depreciation data set is significant (5% level of significance).
3. Severe multicollinearity was found in the proposed regression equation (VIFs >55).

From this, the validity of the RUS data is definitely in question. Sprint conducted its own in-depth analysis of the proposed data set and regression equation (see Attachment 6 for results). The regression results from the RUS data set (n=139) are less than desirable. When using a 5% level of significance, no variable proves to be statistically significant in explaining switch costs in this model.

Furthermore, with the depreciation data set (n=921) the coefficient of determination (adjusted R-squared) appears to be acceptable. However, once again, at a 5% level of significance, only the '1/time*lines' variable is significant. By using theory and intuition, the 'lines' variable by itself should be much more significant than it is (t-stat = -0.642). The data in the Commission's proposed data set or the proposed regression equation appears to be severely tainted. As stated previously, Sprint also has concerns as to how the data has been adjusted. At the request of Commission's staff, Sprint provided actual switching investment for 48 host and 200 remote switches in early February 1999. Extensive analysis was completed to ensure that the data excluded investments attributable to vertical features and services, and that only forward-looking technology was considered. Sprint developed a data template under the guidance of the Commission's staff that was also used by BellSouth and GTE to provide identical data sets for an even larger composite data set of more than 2700 switches. Since staff sought input, and the companies put forth the effort to provide data, it seems reasonable that this more recent and complete data be used as a substitute, or at a minimum a complement, to the RUS and large company depreciation data used by staff.

**Paragraphs 157-159**

Sprint commends the Commission on its effort to recognize data adjustments which are needed to ensure that the RUS data includes a complete set of switching cost data. Sprint agrees with staff that the proposed $12.00 per line cost for MDF costs is reasonable. However, based on Sprint's experience, the proposed HAI default central office power costs are far too low. Sprint proposes that the alternative data of Attachment 7 set developed by Sprint's Network Engineering group responsible for central office power engineering.

## Paragraph 160

It is unclear where the $27,598 Gabel-Kennedy cost estimate to terminate a remote on a host switch originated. It is important to note that this cost will vary significantly based on the trunking requirements for the host-remote umbilical links, which are in turn driven by remote end office sizing requirements. Compiling actual cost data from two states in which it serves, Sprint estimates this cost on average to be closer to $61,700. Sprint suggests that either this higher average value be used, or the model modified to recognize the proper relationship between remote line size and the corresponding variable umbilical cost as shown in the following table:

| Lines | Avg T1s | Avg Cost Per T1 | Avg Cost Per Switch |
|---|---|---|---|
| 0 to 640 * | 4 | $ 5,659 | $ 22,636 |
| 641 to 6390 | 9 | $ 5,148 | $ 46,332 |
| 6391 to 12780 | 21 | $ 5,022 | $ 105,462 |
| * Minimum of 4 T-1 Spans Required | | | |

## Paragraphs 161-162

Sprint agrees with staff that the suggested 8% addition to the RUS data to cover LEC Engineering costs is reasonable. However, as stated previously, Sprint has serious concerns as to the validity of the RUS data set itself. Despite these objections, should the Commission decide to use the data, Sprint recommends that the 8% multiplier be used. Sprint believes that the additional data provided by the three contributing parties should be used, preferably in replacement of both the RUS and altered depreciation data set.

### Methodology

### Paragraph 165

Sprint agrees with staff that the fixed costs of hosts and remotes are different, and that the variable per-line costs are approximately the same. However, based on the study data provided to the Commission, and excluding host/remote umbilical investment, staff's average host fixed costs including the 8% loading factor for E, F, and I costs as discussed above are nearly 70% lower than Sprint's average host switch costs. Staff's average remote fixed costs are approximately 10% higher than the average from the study data provided to staff in February, 1999; however, Sprint's remote switch data set is skewed by a disproportionate number of small rural switches, and are thus lower than what can be expected on a national average. Sprint concludes that the Commission's suggested remote costs are reasonable and should be adopted; however, the average host costs are far too low and should be reexamined.

### Accounting Changes in Cost Over Time

### Paragraph 169

Sprint agrees that usage of packet switching technology will increase over the next decade while corresponding usage of circuit-based networks may decline. Part of this migration will be driven by the economics of handling an increased percentage of total data traffic relative to voice. As switched traffic migrates from voice to data, a crossover point may be reached where packet switching becomes more economical. However, the timing of this process and the cost tradeoff is unclear. Since voice over IP technology is relatively new, mature products do not exist which can replace existing circuit switched networks, nor are reliable costs readily available for these products. Thus it would be premature to forecast with any accuracy what, if any, savings could be obtained from such a migration. Further, any savings contemplated by an accelerated conversion to packet switching technology should also reflect a greatly accelerated depreciation rate over the 16 year digital switching asset life currently prescribed by the Commission.

**Treatment of Switch Upgrades**

**Paragraph 171**

Sprint respectfully disagrees with the staff's conclusion that switch upgrade costs should be excluded. First, it is incorrect to characterize all switch upgrades as being associated with growth. As shown in Attachment 5, the basic drivers to switch infrastructure upgrades in recent years have been in fact more closely correlated with industry and regulatory mandates, which in turn have driven periodic cost additions to bring existing equipment into compliance. Second, growth additions are correlated with performance requirements to the extent that basic service standards must be met, *e.g.*, line demand and minimum trunk blockage requirements. Telecommunication carriers order switching equipment to meet a reasonable period of growth before additional equipment is required. This practice allows a cost-effective balance between switch resource utilization, customer demand requirements, and minimization of ongoing engineering and provisioning costs. A retailer must provide a minimum shelf inventory based on short run anticipated demand levels and enough space to meet that requirement or customers will receive a reduced quality of service. Conversely it would not be prudent for the retailer to install inventory to meet 10 years' of anticipated demand because of a lower initial unit cost. Not only will this ultimately result in greater inventory/stocking costs, it will also likely result in unused and obsolete inventory.

Similarly it would be more expensive for communication carriers to order switches fully equipped for long run demand, since this will result in additional long run costs such as unused